



**ROHDE & SCHWARZ**

TECHNICAL INFORMATION

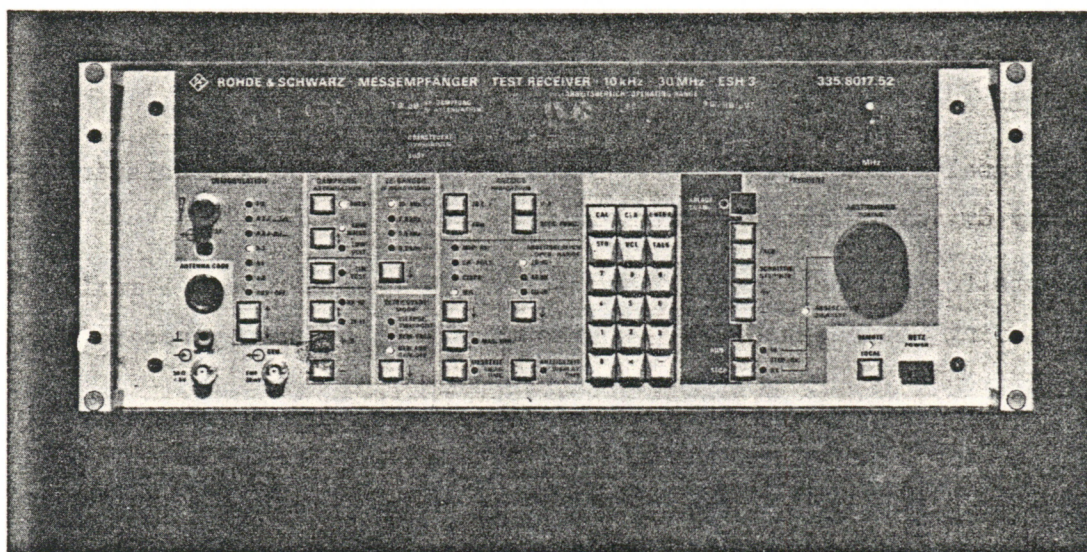
**ESH 3**

**IEC 625 Bus**



# PROGRAMMABLE TEST RECEIVER

10 kHz to 30 MHz



## APPLICATIONS

- FIELD-STRENGTH MEASUREMENT WITH THE AID OF TEST ANTENNAS
- RADIO INTERFERENCE MEASUREMENT COMPLYING WITH CISPR PUBLICATIONS 1 AND 3 AND VDE 0875
- INTERFERENCE MEASUREMENTS ACC. TO MIL STANDARDS AND VG REGULATIONS
- RADIOMONITORING, REMOTE FREQUENCY MEASUREMENT
- SELECTIVE VOLTAGE MEASUREMENT IN LABORATORY AND TEST DEPARTMENT

### SPECIAL FEATURES

Frequency resolution 100 Hz.

Automatic scanning with adjustable start and stop frequencies and adjustable step sizes.

Automatic error correction over entire frequency range after one calibration.

Accuracy to CCIR recommendations.

Measurement of voltage, field-strength, current, broadband noise and two-port attenuation with indication of appropriate unit.

Conversion and bandwidth factors automatically taken into consideration.

Choice of data output in  $\mu\text{V}$ , dBm, dB $\mu\text{V}$  and the respective units for current, field strength and broadband noise.

Additional signal evaluation capabilities: frequency-offset, modulation-depth and frequency-deviation measurements.

Analog outputs for connection of XY recorders, YT recorders and a maximum of 5 Radiomonitoring Recorders ZSG 3 for frequency band occupancy recording.

IEC-625-bus connector with listener and talker function capability. Talk-only mode for recording measured data without controller using a printer or a digital cartridge tape drive.

Storage of 10 complete device settings and 5 ranges for automatic frequency scanning. The last device setting is also stored after switch-off.

The Test Receiver ESH 3 which measures and demodulates AM double-sideband, single-sideband, pulse-modulated and FM signals as well as noise voltages in the range 10 kHz to 30 MHz is suitable for manual and programmed use as

Selective RF voltmeter which also measures RF current  
when used in conjunction with the Clamp-on RF Current Probe ESH2-Z1  
(100 kHz to 30 MHz)

Field-strength meter in conjunction with the test antennas used in  
the HFH 2 system

Building block in automatic test systems.

It contains the same RF, selective and demodulation networks as the ESH 2 and, as a result, features the same excellent RF characteristics.

In addition, it offers, however, a number of extra signal evaluation capabilities, great operational ease and convenient data output and is a programmable building block for use in semi- and fully automatic systems providing the following additional features:

- 1) Digital level indication in selectable units
- 2) Measurement of frequency offset, frequency deviation and modulation depth
- 3) RF and IF attenuation can be preset or automatic ranging selected (and then for either low noise or low distortion)
- 4) Tuning in steps of preset-frequency (e.g. to measure harmonics or channels 9 kHz apart)
- 5) Automatic scanning with data output to a printer and/or an XY recorder, a YT recorder or a radiomonitoring recorder
- 6) Storage of last and nine additional device settings even when the ESH 3 is switched off or the supply is interrupted
- 7) Storage of correction values after calibration ensuring full accuracy of the ESH 3 over the entire frequency range and with any IF bandwidth, indicating mode, and demodulation range, without the need for constant recalibration
- 8) IEC-bus connector for computer control

The subsystems and data output via the front panel, IEC-bus connector and recorder outputs are controlled by two microcomputers. The device functions are set via a keyboard on the front panel or - in programmed operation - via the IEC-bus connector.

A 13-digit alphanumeric display facilitates data input (frequencies, measurement times, limit levels) and data output. In addition, a row of LEDs is provided to read out the analog value of the input voltage within the limits of the demodulator operating range. Another row of LEDs reads out the frequency offset.

Automatic ranging and automatic scanning enable the ESH 3 to carry out complex automatic measurements without a computer and to obtain hard copy at little extra expenditure. Computer control of the ESH 3 provides in addition the following measurement capabilities via the IEC-bus connector:

Performance of complicated test programs

Automatic evaluation of large quantities of data from various points of view

Use of the ESH 3 together with other programmable measuring instruments.

## Specifications

### Frequency

Range	10 kHz to 29.999 MHz
Readout	6-digit LED display
Resolution	100 Hz
Setting error	
Range 10 to 150 kHz	< 100 Hz (for more exacting setting
Range 0.15 to 30 MHz	< 500 Hz accuracy requirements an external reference input (5 or 10 MHz) is provided)

### Selection

- 1) with tuning knob in steps of 0.1 and 10 kHz (switch-selected)
- 2) keyboard entry
- 3) tuning in steps of any presettable size
- 4) automatic scanning

### 1st IF

75 MHz

### 2nd IF

9 MHz

### 3rd IF

30 kHz

### IF bandwidths (6 dB)

for average-value and peak-value measurements

0.2 kHz  
0.5 kHz (when measuring sinewaves  
2.4 kHz reduced measurement accu-  
10 kHz racy at 0.2 kHz)

for measurements according to  
CISPR Publ. 1 and 3 according to  
VDE 0875

0.2 kHz (10 kHz to 149.9 kHz)  
9 kHz (0.15 to 30 MHz)

### IF rejection

> 100 dB, typ. 110 dB

### Image frequency rejection

> 100 dB, typ. 120 dB

### RF input

BNC female connector

### Input impedance

50  $\Omega$

### VSWR

at 0 dB RF attenuation

< 2

at 10 dB RF attenuation

< 1.2

### Max. input voltage

at 0 dB RF attenuation

3 V corresponding to 130 dB( $\mu$ V)

at  $\geq$  10 dB RF attenuation

7 V corresponding to 137 dB( $\mu$ V)

### Oscillator reradiation

< 1  $\mu$ V

Intercept point (IM product  
3rd order)

typ. +25 dBm

(IM product  
2nd order)

typ. +55 dBm

(2nd harmonic)

typ. +70 dBm

### Measurement ranges

#### Voltage

(lower limit: typ. inherent noise voltage)

Average value	-30 to +137 dB( $\mu$ V)
Peak value (for pulse signals)	-3 to +146 dB( $\mu$ V/10 kHz)
max. pulse energy	1 mWs
max. continuous power	1 W
Measurement error	< 1 dB
Frequency offset	-5 kHz to +5 kHz
(dependent on IF bandwidth)	
Frequency deviation	0 to 5 kHz
(dependent on IF bandwidth)	
Modulation depth	0 to 100%
Gain	-110 dB to +57 dB

### Indication of measured value

Digital data output is obtained on a 13-digit alphanumeric display which in addition to the figures also reads out the full unit. Indication of level, frequency offset, frequency deviation, modulation depth or gain can be selected.

#### Level

digital in dB( $\mu$ V), dBm, etc.	4 digits, resolution 0.1 dB
in $\mu$ V, mV, V, etc.	3 digits, resolution: 1 LSD
analog	row of LEDs (31 LEDs) within the operating range of the IF rectifier and with digital indication of range boundaries
Operating ranges of the IF rectifier	20, 40, 60 dB
Indicating modes	average value with adjustable averaging time peak value with adjustable hold time CISPR with adjustable measurement time broadband noise measurements acc. to MIL standards determination of maximum and minimum levels over preset period of observation

#### Frequency offset

digital in kHz	3 digits, resolution 10 Hz
analog	row of LEDs (16 LEDs)

Frequency deviation and modulation depth

digital: deviation in kHz	3 digits, resolution 10 Hz
modulation depth in %	2 digits, resolution 1%
Gain (between generator output and RF input)	
digital in dB	4 digits, resolution 0.1 dB
Classes of demodulation	A0, A1, A3, A3J(LSB/USB), F3
Remote control	

Interface according to IEEE 488 and IEC 625-1 for control of all device functions and for data output

Interface functions	AH1, L2
	SH1, T1
	RL1
	SR1, PP1
	DC1, DT1

Connector	24-pole female, Amphenol
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Outputs

Front panel

Generator output (can be switched off)	$Z_{out} = 50 \Omega$ , BNC female connector
EMF	86 dB( $\mu$ V) $\pm 0.5$ dB
Connector for antenna supply and identification to set correct parameters	12-pole female, Tuchel
AF output	$Z_{out} = 10 \Omega$ , jack JK 34
EMF	variable up to 3.5 V

Rear panel

75-MHz IF output	$Z_{out} = 50 \Omega$ , BNC female connector
EMF	approximately 12 dB above input level at 0 dB RF attenuation
30-kHz IF output	$Z_{out} = 1 k\Omega$ , BNC female connector
EMF	0 to 2 V in the range of analog level indication
AM demodulator output	$Z_{out} = 10 k\Omega$ , BNC female connector
EMF	1 V/100% modulation depth
FM demodulator output	$Z_{out} = 10 k\Omega$ , BNC female connector
EMF	$\pm 0.5$ V for 5 kHz deviation
Frequency offset output	$Z_{out} = 10 k\Omega$ , BNC female connector
EMF	$\pm 5$ V for 5 kHz offset

Analog level output 1 EMF (with AV, PEAK and PEAK(3 s) indication)	$Z_{out} = 1\text{ k}\Omega$ , BNC female connector 0 to +5 V between boundaries of analog level indication
EMF (with CISPR indication)	0 to +2 V between boundaries of analog level indication
Analog level output 2 EMF (with CISPR indication)	$Z_{out} = 10\text{ k}\Omega$ , BNC female connector 0 to +2 V between boundaries of analog level indication (includes a lowpass network for simulation of panel-meter response)
Input for external reference frequency	$Z_{in} = 50\text{ }\Omega$ , BNC female connector
Required level	EMF = 1 V at 50 $\Omega$ , sinewave
Frequency	5/10 MHz (switch-selected)
Recorder outputs	24-pole female Amphenol connector, contains coding lines to identify recorder type analog X and Y outputs pen lift control DIN-A4-format paper advance for the ZSKT connection of 5 Radiomonitoring Recorders ZSG 3
<u>General data</u>	
Nominal temperature range	+5 to +45°C
Storage temperature range	-25 to +70°C
AC supply	115/125/220/235 V +10/-15% 47 to 440 Hz (70 VA)
Overall dimensions (W x H x D)	492 mm x 205 mm x 514 mm
Weight	approx. 25 kg
Order designation	Test Receiver ESH 3 335.8017.52
Accessories supplied	Power cord 025.2365.00 Manual



Recommended extras

Clamp-on RF Current Probe 100 kHz to 30 MHz, ESH2-Z1	338.3516.52
Active Voltage Probe ESH2-Z2	299.7210.52
Passive Voltage Probe ESH2-Z3	299.7810.52
Artificial Mains Network 4x25 A, ESH2-Z5	338.5219.52
Rod Antenna 10 kHz to 30 MHz, HFH2-Z1	335.3215.52
Loop Antenna 10 kHz to 30 MHz, HFH2-Z2	335.4711.52
Loop Antenna 10 to 150 kHz, HFH2-Z3	335.6214.52
Tripod HFU-Z (in carrying bag)	100.1114.02
Inductive Probe HFH2-Z4	338.3016.52
XY Recorder ZSKT	301.9010.02
XYT Recorder ZSKT	301.9010.02
Radiomonitoring Recorder ZSG 3	242.6015.92
Headphones	110.2959.00